



COMPOUND OBJECTIVE LENS [HAVING TWO
FOCAL POINTS, IMAGING OPTICAL SYSTEM FOR
CONVERGINING LIGHT WITH THE COMPOUND
OBJECTIVE LENS, OPTICAL HEAD APPARATUS FOR
RECORDING OR REPRODUCING INFORMATION WITH
THE IMAGING OPTICAL SYSTEM,] FOR OPTICAL
[DISK] DISKS HAVING [TWO TYPES OF RECORDING]
DIFFERENT THICKNESSES

CROSS-REFERENCE TO RELATED
APPLICATIONS

This application is a continuation-in-part of U.S. Pat.
application Ser. No. 08/190,520, filed Feb. 1, 1994 now U.S.
Pat. No. 5,446,565.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a compound objective
lens composed of an objective lens and a hologram lens
which has two focal points, an imaging optical system for
converging light on two converging spots placed at different
depths of an information medium with the compound objec-
tive lens, an optical head apparatus for recording, reproduc-
ing or erasing information on or from an information
medium such as an optical medium or a magneto-optical
medium like an optical disk or an optical card with the
imaging optical system, an optical disk in which a series of
high density recording pits and a series of comparatively low
density recording pits are provided, an optical disk apparatus
for recording or reproducing information on or from the
optical disk with the compound objective lens, a binary
focus microscope having two focal points in which two
types of images drawn at different depths are simultaneously
observed, and an alignment apparatus for aligning two types
of images drawn at different depths with the binary focus
microscope.

2. Description of the Related Art

An optical memory technique has been put to practical
use to manufacture an optical disk in which a pit pattern
formed of a series of pits is drawn to record information. The
optical disk is utilized as a high density and large capacity
of information medium. For example, the optical disk is
utilized for a digital audio disk, a video disk, a document file
disk, and a data filed disk. To record information on the
optical disk and to reproduce the information from the
optical disk, a light beam radiated from a light source is
minutely converged in an imaging optical system, and the
light beam minutely converged is radiated to the optical disk
through the imaging optical system. Therefore, the light
beam is required to be reliably controlled in the imaging
optical system with high accuracy.

The imaging optical system is utilized for an optical head
apparatus in which a detecting system is additionally pro-
vided to detect the intensity of the light beam reflected from
the optical disk. Fundamental functions of the optical head
apparatus are classified into a converging performance for
minutely converging a light beam to form a diffraction-
limited micro-spot of the light beam radiated on the optical
disk, a focus control in a focus servo system, a tracking
control in a tracking serve system, and the detection of pit
signals (or information signals) obtained by radiating the
light beam on a pit pattern of the optical disk. The funda-
mental function of the optical head apparatus is determined
by the combination of optical sub-systems and a photoelec-
tric transfer detecting process according to a purpose and a
use. Specifically, an optical head apparatus in which a
holographic optical element (or hologram) is utilized to
minimize and thin the optical head apparatus has been
recently proposed.

2.1. Previously Proposed Art

Fig. 1 is a constitutional view of a conventional optical
head apparatus proposed in Japanese Patent Application No.
46630 of 1991 which is applied by inventors of the present
invention.